

~~SECRET~~ A/B, 1, 38/17

Chief, Medicine Division, SI

4 May 1953

Chief, Biochemistry & Pharmacology Branch, SI

Survey on Lysergic Acid Diethylamide

1. Submitted herewith is a brief resume of the rather extensive survey on Lysergic Acid Diethylamide undertaken by the staff members of this branch upon the request of ~~_____~~ A

A 2. The complete data being assembled for the subsequent attention of ~~_____~~ were obtained with the cooperation of the following individuals:

A _____

C _____

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C _____

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A ~~_____~~

A ~~_____~~ (2 May 53)

D-Lysergic Acid Diethylamide (LSD-25)

Summary

Although the effects of ergot have been known and experienced by many countries down through recorded history, the parent compound, lysergic acid, was not discovered until 1938. The LSD effect on the mind was not observed until 1943⁽³⁾. LSD produces a wide range of pharmacological, physiological and psychophysiological reactions in both man and animals^(5,6).

Some of the more outstanding effects are the mental confusion, helplessness and extreme anxiety which are produced by minute doses of this substance^{5,7,8}. Based upon these reactions, its potential use in offensive psychological warfare and in interrogation is considerable and it may become one of the most important of the psychochemical agents. The mode of action, although not completely known to date, is believed to be due to an increased glycogen metabolism with a probably block of the hexosemonophosphate catabolism. To date there is no known antidote⁷.

Great interest has been shown by Soviet bloc countries in this compound and reports are available which indicate considerable traffic in this drug and the raw ergot from which it is prepared. One report indicates that sufficient material for 50,000,000 doses was purchased by the Soviets from Switzerland in 1951¹⁰. Due to low potency of the ergot collected in East German rye fields, Mothes and co-workers have undertaken the cultivation of selected strains of ergot and the artificial infection of both rye and barley, the latter succeeding readily¹¹. Mothes also started experiments with biosynthesis of potent agents found in ergot¹². Manufacture of lysergic acid is controlled by SANDOX Ltd. of Switzerland to whom the patent was issued¹³.

This company had a virtual monopoly on the purchase of ergot grown in this country. It is reported, however, that the ~~company~~ is currently obtaining 10-12 tons of ergot each month from screened rye in Michigan¹⁴. In the U.S. considerable interest has been aroused in psychochemical agents and particularly in lysergic acid. At present extensive research on this compound is being done by the ~~company~~.

~~company~~ Under this contract, an attempt

is being made to synthesize lysergic acid as well as many of its derivatives and analogues⁷. To date the only derivative which has been synthesized is di-hydrolysergic acid. Clinical evaluation of the effect of this compound has not yet been attempted. Admixtures containing lysergic acid diethylamide other than with barbiturates to shorten the period of apprehension have apparently not been tried. The biosynthesis of d-lysergic acid diethylamide has not been attempted in this country as far as we know.

Probably the greatest difficulty in the effective exploitation of lysergic acid and its derivatives is the difficulty in extrapolating experimental animal data back to humans in order to predict results.¹⁵ Although one of the research workers are known to be reluctant to use this compound for clinical research, some research on the material produced from the natural product by the ~~Swiss~~ ¹⁶⁻¹⁸ has been clinically evaluated and recorded both in Boston and New York.

CONCLUSIONS

1. D-Lysergic Acid Diethylamide is a psychochemical agent of considerable potential value as a strategic agent.
2. The Soviet Union has shown great interest in it and has procured considerable quantities of it.
3. The Sandoz Ltd. of Switzerland ^{is the major} ~~virtually controls~~ the manufacture of this substance, although ~~Switzerland~~ ^{is} producing some under contract for experimental use.
4. Research on this agent is going on in this country, both in the field of the synthesis of derivatives and psychological studies.
5. The synthesis of this compound is long and difficult, and 15 steps occur in the organic synthesis. The yield of this material is known to be very low when obtained through partial synthesis from ergot.
6. No biosynthesis is being undertaken in this country, although it is applied abroad in the plant research institute of Gatersleben of East Germany.
7. Some clinical data are available on its use both in this country and in Europe.

ANEMONE

Life Cycle of Ergot

- a. Head of rye with prominent hardened, dark-red fungus bodies - ergot
- b. Sprouting ergot with several stalked globular heads
- c. Flask shaped cavities imbedded in the surface of a single head
- d. Single cavity with numerous tube-like sexual sacs or asci
- e. Filiform ascospores in closed and opened sacs
- f. Single ascospores, capable of infecting rye flowers, forming a mycelium therein
- g. Mycelium, spreading in the grain tissue, forming bead-like, asexual spores (conidia) for further infections

APPENDIX A

Selected LSD References

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2. Jacobs, W. A. & L. C. Craig, Journal of Biol. Chem., Vol. 104, pp. 547- (1934)
3. Stoll, W. A., Schweis, Arch. f. Neurol. u. Psychiat., pp. 60, 279- (1947)
4. Sandoz Ltd., Report from the Pharmacology Laboratories, November 1952
5. Comiran, G., "Clinical Experiences with Lysergic Acid-Diethylamide in Normal and Mentally Sick Persons," Acta Psychiat. et Neurol., Vol. 24, pp. 9-32, 1949.
6. Forrer, G.R. & Goldner, R.D. "Experiment Physiological Studies with Lysergic Acid Diethylamide (LSD-25)" Arch. of Neurology and Psychiatry, pp. 66, 501-508, 1951
7. Private Communication and Tape Recorded Interrogation of [REDACTED]
8. Savage, Charles. "Lysergic Acid Diethylamide (LSD-25). A Clinical-Physiological Study" (Research Report Project No. 091 055-6.02, 9 September 1951), American Journal of Psychiatry, Vol. 108, pp. 879, 1952.
9. W. Hoyer-Gross, McAdams, W., Walker, J.W. NATURE, London, Vol. 168, pp. 827-829, 1951. "Psychological & Biochemical Effects of Lysergic Acid Diethylamide."
10. [REDACTED]
11. Bethke, K., & Silber H. "Cultivation of Ergot" Die Pharmazie, VII, pp. 310-313, 1952.
12. [REDACTED] Information from Biology Consultant, [REDACTED]
13. Patent Specification 579,404. Appl. Date (U.K.) April 28, 1944. Granted August 6, 1946.
14. Special Report by Dr. D. M. Crooks, Department of Agriculture, Division of Tobacco, Medicinal & Special Crops
15. Dacker, A. M. "The Psychopathology of the Lysergic Acid Diethylamide Effect." Wiener Z. Nervenk. Vol. II, pp. 1-54, 1949. ID. 749993.
16. Finkel, M., DeShon, M.J. Hyde, R. W. & Solomon, H.C. "Experimental Schizophrenia-like Symptoms." American Journal of Psychiatry, Vol. 108, pp. 572-578, 1952.
17. DeShon, M.J. Finkel, M., & Solomon, H.C. "Mental Changes Experimentally Produced by Lysergic Acid Diethylamide." The Psychiatric Quarterly, Vol. 26, pp. 33-53, 1952.
18. Hoch, P.H., Cattell, J.P., & Pennea, H.H. "Effects of Mescaline and Lysergic Acid." American Journal of Psychiatry, Vol. 108, pp. 579-584, 1952.

A/D, 1, 38/18

Chief, Chemical Division, TSS

18 May 1953

Deputy Director of Security

Newspaper Article of 14 May 1953.

Reference is made to our conversation concerning the attached newspaper article which appeared in the 14 May issue of the Washington Star. Please note the report from Gallup, New Mexico reported by doctors that residents of that city have been bothered by a wave of nausea and lightheadedness. Although the possibility is remote, it may be that "seranim" could be involved and it is suggested that a routine inquiry, through Public Health, be made as to the facts of the case.

A

Attachment: Newspaper Article (as indicated above).

C
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P
Y

113, 125 P111
PRIORITY

H

PRIORITY CONFIDENTIAL TO WASHINGTON FIELD

A

TO [REDACTED] FOR SCI BR [REDACTED] FROM [REDACTED] SECURITY
INFORMATION-CITE [REDACTED]

H

LYSINE ACID AMIDES ARE PRODUCED BY THE SANDOZ COMPANY IN BASEL,
SWITZERLAND. THIS COMPANY HAS A US RPT US SUBSIDIARY IN NEW YORK FROM
WHICH YOU CAN OBTAIN A SAMPLE FOR PHARMACOLOGICAL AND CLINICAL TESTING.

C

THE DIRECTOR OF THE US RPT US COMPANY IS [REDACTED] RPT [REDACTED]

THESE COMPOUNDS ARE BEING INVESTIGATED CLINICALLY, AMONG OTHERS,

C B

H/B-6

BY [REDACTED] RPT [REDACTED]
[REDACTED] RPT [REDACTED] IN ITALY HAS [REDACTED] HYPNOTIC COMPOUNDS
INDEPENDENTLY AND AS EVIDENCED BY HIS PUBLICATION HE HAS PREPARED AND
STUDIED PHARMACOLOGICALLY AND CLINICALLY SUCH COMPOUNDS FOR OBSTETRICAL
EFFECTS AS WELL AS FOR SYMPATHOLYTIC EFFECTS BUT AS FAR AS WE KNOW, NOT
FOR THEIR EFFECTS ON THE CENTRAL NERVOUS SYSTEM. HIS WORK IS PUBLISHED
IN RENDICONTI ISTITUTO SUPERIORE DI SANITA, VOLUME XV, PART X, 1952 RPT
✓ RENDICONTI ISTITUTO SUPERIORE DI SANITA, VOLUME XV, PART X, 1952 -- A
SPECIAL NUMBER ON SYNTHETIC DRUGS.

2 1
VOLUME

AN ARTICLE IN MODERN HOSPITAL, MAY 1953 PAGE 98 RPT MAY 1953, PAGE 98,
THE ERGOT ALKALOIDS -- THE RELATION OF STRUCTURE TO OXYTOIC PROPERTIES
BY EDWARD F. DOMINO, MD, RPT EDWARD F. DOMINO, MD, CONTAINS A LIST OF REF-
ERENCES ON THIS SUBJECT.

H/B-6

SANDOZ AND [REDACTED] ARE THE ONLY SYNTHESIZERS OF THE AMIDES THAT SOURCE

A/B, 1, 38/20

Chief, B&P Branch

A

9 July 1954

Chief, Technical Branch, SO

1. Returned herewith is your report on Lysergic Acid and related compounds which you forwarded to this Office for study.
2. In the writer's opinion, this is an excellent work and one which should be disseminated to proper personnel as soon as possible since the knowledge contained herein is important and definitely needed.
3. The writer feels that while it is wise to avoid expressing Agency interest in use of the chemicals mentioned, it is very foolish not to make certain of our people cognizant of LSD and related psychogenic chemicals.
4. It would be greatly appreciated if when this paper is published that the Security Office be given at least four copies.
5. [redacted] (the psychiatrist who worked with the ARTICHOKE group until his retirement 30 June 1954) studied the pamphlet and he commented in writing concerning the paper as follows: "A comprehensive description and superior analysis of the chemical and its effects."
6. The courtesy in allowing this Branch to examine this paper is greatly appreciated.

A

A

H/O, 1, 39/24

A [redacted] informed the writer that at the present time there is being held in Washington some type of scientific conference in which [redacted] H-B-1
 H-B-1 [redacted] and American scientists have been discussing various items of interest to intelligence. Particularly interesting was the fact that
 A one of the scientific officers in [redacted] department stated
 D that a [redacted] who is now in Washington, a [redacted] scientist, H-B-1,
 D made the statement that experimentally LSD had been used in interrogation and had proved remarkably successful. [redacted] is alleged to
 have stated that 100 gamma of LSD was given to a [redacted] officer who had H-B-1,
 been instructed not to reveal a significant military secret. After
 the LSD was given to the [redacted] officer, under interrogation, he gave H-B-1,
 all the details of the secret which was recorded and after the effects
 of the LSD had worn off, the [redacted] officer had no knowledge of revealing H-B-1,
 the information (complete amnesia). Not only that but the [redacted] H-B-1,
 officer did not believe he had revealed the information and was
 asounded it had been revealed in such complete, accurate detail.

A 2. [redacted] wanted to find out whether or not the writer or
 A any representatives interested in interrogation from Security could
 A D talk with [redacted] if an arrangement along these lines could be made.
 A As far as [redacted] knew, [redacted] was still in Washington and
 D may possibly be here for the next several days. The writer asked [redacted]
 D to obtain all details possible through his own staff which
 will again meet in conference with the [redacted] and [redacted] scientists H-B-1,
 and find out how long [redacted] will be in town and whether or not
 [redacted] would be willing to talk along lines of interest.

A 3. The writer informed [redacted] that he in turn would put
 A the problem up to Security and see if authorization could be obtained
 D for the writer, possibly [redacted] and possibly others to talk
 to [redacted] particularly along lines of "defensive techniques."

4. This information is extremely important because it is the
 first actual reported use of LSD in successful interrogation along
 intelligence lines although there is some information along criminal
 lines coming out of Germany. The facts, however, and details are at
 the present writing very limited.

A [redacted]
 20 July 1954

A * [redacted]

[redacted]

A/D, 1, 38/22

Chief, Medicine Division, SI

Acting Chief, Biochemistry and Pharmacology, M/SI

Experiments with LSD-25

D 1. According to [REDACTED] experiments with LSD-25 have been carried on in [REDACTED] in order to test the doses required, at least 12 human subjects of not too high mentality were selected. They were told only that a new drug was being tested and promised that nothing serious or dangerous would happen to them. They were given doses of from 50 to 150 , some on alternate and others on every fourth day. During the intoxication they realized that something was happening, but were never told exactly what. All of the testing was done under the supervision of a trained psychiatrist.

2. A dose of 150 was finally selected to be used on a test subject in the interest of intelligence. The subject is believed to have been an [REDACTED]. He was told the nature of the test and then given the LSD-25 in water by a psychiatrist who was the only person to witness the test. Although no direct questions were asked, the psychiatrist led the general conversations into appropriate channels and the subject disclosed certain information which he had been previously warned against revealing. At the conclusion of the experiment, the subject stated that to the best of his knowledge he had disclosed nothing. When confronted by the statements he had made, he was amazed.

3. The dosage varies greatly from person to person, but it seems that the higher the mentality, the higher the dose, and conversely.

B 4. The source of LSD-25 was Sandoz, Ltd., of Switzerland. Further, Sandoz has supplied several laboratories with ample LSD-25 to conduct research, including the [REDACTED]. In addition, anyone in the world who wants samples of this material may obtain them providing, of course, they are legitimately engaged in research pertaining to the subject. This presumably applies to East Germany and any other Bloc countries, as well as to the USSR.

D 5. [REDACTED] feels that the USSR could produce this material at any time, if it has not already done so, and if it is not obtaining adequate samples directly from Sandoz.

[REDACTED]

[REDACTED]

6. It appears as though the activity of LSD-25 decreased rather markedly around the fourth day after it is put into solution. One explanation for this fact, advanced by [REDACTED], is that the few bacteria in water are either metabolizing the LSD-25 or their by-products are destroying it or otherwise inactivating it. The magnitude of the decrease in activity in four days is roughly forty per cent or thereabouts.

7. This is the only experiment of its kind known by [REDACTED] to have been conducted in the interest of intelligence in [REDACTED] H-8-1. He had no knowledge of any future tests with LSD-25. It must be kept in mind that, other than planning the experimental design and reviewing the results, he took no active part in the experiment. Finally, inasmuch as LSD-25 is a relatively new drug, the dosages of which are still regarded as undetermined for eliciting specific responses, [REDACTED] feels that many more experiments should be conducted before more definitive answers can possibly be elicited.

A [REDACTED]

[REDACTED] 21 Jul 54

COPY: 13 Aug 54

[REDACTED]

A/B, 1, 38/2

1. [REDACTED] claims that [REDACTED] has completed the synthesis of Lysergic Acid.

- a) What evidence is available? hearsay, verbal, written, recorded?
- b) What scope of accomplishment? gamma, mg. gm. quantitation
- c) Is any of this synthesized LS^a available - how much?

2. [REDACTED] claims LSD is ^a/relatively rapidly destroyed substance

- a) What incidence is available? hearsay, verbal, written, recorded?
- b) Under what conditions is stability secured?
- c) Under what conditions is stability uncertain or failing?
- d) What metabolic evidence is available of breakdown?

3. Where does [REDACTED] obtain his supply of LSD?

4. [REDACTED] claims harmine is less effective than LSD.

- a) What evidence is available, hearsay, verbal, written, recorded?
- b) Where did he obtain harmine?

5. Where does [REDACTED] obtain his supply of serotonia?

6. Can [REDACTED] formulate his conception of the mechanism of action of LSD?

A/B, 1, 58/25

Office Memorandum • UNITED STATES GOVERNMENT

TO : Chief, Technical Branch, Security Office

DATE: 17 December 1954

FROM : Chief, Contact Division, OO

SUBJECT: [REDACTED] C

REFERENCE: [REDACTED]

1. We recently interviewed [REDACTED] chairman of the Department of Psychiatry. [REDACTED] was the author of [REDACTED] which we sent to you under [REDACTED]

2. [REDACTED] gave us the enclosed document concerning his temporary duty in Japan, Okinawa, and Korea. While the document itself is probably of no great interest, it gives an indication that [REDACTED] himself might be of interest to TB/SO. Our representative, during the course of a casual conversation with [REDACTED] was interested by [REDACTED]'s statement that the approach now being used in psychiatric interviews is more apt to produce results than is the approach currently being used by field interrogators; however, he did not criticize efforts currently being made by interrogators nor did he indicate that psychiatrists would make better field interrogators.

3. Our representative asked [REDACTED] for a lead to documents dealing with this subject. [REDACTED] said that he, [REDACTED] and [REDACTED] had prepared a study entitled [REDACTED]

[REDACTED] With this book, there is a set of phonograph records of actual initial interviews.

4. We have requested a name check clearance on [REDACTED] C
He is a naturalized U.S. citizen and a cleared consultant of the [REDACTED] Office.

Enclosure

A

[REDACTED]

A/B, 1, 38/27
16 March 1955

MEMORANDUM FOR RECORD

H SUBJECT: Distribution of [REDACTED] --- "OSI Report on "The Strategic Medical Significance of the Psychogenic Drug, Lysergic Acid Diethyl Amide, LSD-25 and Related Compounds"

A 1. Dissemination of the subject report was discussed on 11 Mar 55 with [REDACTED], Deputy Director of Security.

A 2. It was recognized that a great part of the report was prepared with unclassified literature as its basis. However, [REDACTED] pointed out that the Agency's study of and interest in the subject is not a matter of general knowledge and must be very closely held.

H 3. It was his recommendation, agreed to by the undersigned, that distribution of the subject report be identical with that given a previous Scientific Intelligence Memorandum on the same subject, [REDACTED], dated 5 August 1954, which was as follows:

G 1 Copy DCI (personal file)
1 " DDCI
1 " DDI
1 " [REDACTED]
2 " C/TSS
2 " Dir. Security
7 " AD/SI

B-1

A [REDACTED]

Copies to:

AD/SI
Dir. of Security
SI/SS-Eng
SI/M
SI file
LLT
Chrono

H

APR 18 1955

10 November 1955

This is information derived from [REDACTED] neurosurgeon at the

██████████ says that he had lunch with ██████████ during the recent meeting of the American College of Surgeons in Chicago. ██████████ told ██████████ that he himself had recently visited the Brain Institute in Moscow at the invitation of Soviet scientists.

_____ further stated that he had found out that the Moscow Brain Institute was undertaking intensive work in conditioned reflexes in humans. In fact, he also stated that the Soviet Government requires that all physiological laboratories produce work in conditioned reflex responses. It is of particular interest to us that _____ observed two cases in which reflexes had been conditioned. In one of these cases--that of a young boy--a salivary fistula had been produced. The boy was conditioned so that when he thought of or said the number "4", he salivated. When they demonstrated him for _____ they asked him to divide 8 by 2, and before he could actually verbalize the number "4" he salivated. Another case was that of a man with a duodenal ulcer who had been conditioned to the face of a dial so that when the dial indicated a certain number his stomach contracted. There was a similar case in which a man had been conditioned so that his bladder contracted as he watched a dial indicate a certain number--and thus he urinated in response to the dial. _____ apparently asked _____ whether he thought that these conditioned reflex experiments in humans might be undertaken in slave labor camps or have some other ominous significance. _____ did not explain the background of his question.) _____ gave a firm negative, with some evidence of distaste.

It is of further interest that the Russians have translated [redacted] book on the cerebral cortex ([redacted]) and his book on epilepsy and functional anatomy [redacted]. This is of interest because these books contain the basis for his work on memory--and this is the part of the books with which the Russians are most concerned.

A